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Naturally occuring asbestos: correlation between excavation methods, lithologies and analytical methodologies for the quantification of asbestos

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The tunnelling opera of "Terzo Valico dei Giovi" is a new railway line from Genova to Milano that consists in open and underground line and it is situated in Piedmont in the North - West Italy, a geological area characterized by the presence of ultramafic, ophiolitic and sedimentary rocks that can contain asbestos. The excavation work across this rocks is very complex and the quantification of NOA (Naturally Occurring Asbestos), necessary for environmental monitoring and material management, is strictly related to the different lithologies and the natures of samples. The present dataset considers a lot of samples carried out from traditional excavation, TBM drilling (Tunnel Boring Machine), quarries and core drilling for environmental monitoring and geognostic surveys.
The aim of this study is to discuss the correlation between these samples and the analytical methodologies for characterization and quantification of asbestos minerals.
The first step of preparation, common to all litotype, is quartering the starting sample then dried in oven at 150°C. The traditional excavation material is mild milled, the powder material obtained is classified by wet sieving in different grain size classes and for each one a slide with oil of a known refractive index is prepared for the PCOM analysis. In case of lime or silt grain size >70%, it is preferred to use a SEM analysis, with an intensive milling of the sample and filtration of a water solution of the powder obtained on a polycarbonate membrane.
Concerning that the TBM drilling samples are made by >70% fine grain size, the presence of asbestos minerals is determined by SEM methodology.
Massive core drilling samples need to be crushed to reduce grain size, quarted and mild milled for optical microscopy analysis; sedimentary core drilling material is quarted and milled for the PCOM if finest grain size is <70%, otherwise a specimen is prepared for scanning electron microscopy.
Our experience and the results obtained confirm that the characterization and quantification of asbestos in NOA can be determined with PCOM and SEM analysis, the better approach is the one that fit with the lithology and nature of the material. Both methodologies show limits and advantages so, when it's possible, it is opportune the comparison between the results obtained by both methodologies.